Extension Folder 661—1983

MANAGEMENT OF CROPS AND SOILS
IN NORTH CENTRAL
AND NORTHEASTERN MINNESOTA
CORRESPONDENCE COURSE

Unit 7—Growing Corn for Grain and Silage

Purposes

- Recognize the management factors that will help you attain best corn grain and silage yields.
- Understand production practices to use on your farm to produce high quality corn grain and silage.

CORN PRODUCTION FOR GRAIN OR SILAGE

The production practices that lead to maximum yields of corn grain are generally similar to those that result in high quality silage yields. Where differences exist, they are discussed in the appropriate section.

Selecting the Best Hybrid

In selecting the best hybrid for your farm, you must consider three important factors: relative maturity, type of hybrid, and yield of grain or silage.

Relative Maturity. Corn hybrids are classified and labeled with a relative maturity rating in days. The state is divided into maturity zones that indicate the maximum maturity day corn that can be grown in each zone (see map). The relative day rating system does not correspond to actual days in the growing season; rather, it is a method of ranking hybrids in relative order of maturity to one another. For your particular zone (see map) there are standard or check hybrids of certain maturities that all other hybrids are compared to. If the hybrid being tested is mature and the moisture content compares favorably with the check hybrids of a certain relative maturity, then it is given that maturity rating.

Maximum yields usually are obtained from the full season hybrids for each zone. In the northern zone, for example, hybrids with an 85-day relative maturity rating will, on the average, yield higher than earlier maturing hybrids.

The maturities recommended for each zone on the map are those for corn grain production. Hybrids with these maturities should reach physiologic maturity before the first killing frost, provided they are planted before the middle of May.

For best maturity management, you should plant more than one relative maturity hybrid. Doing so raises the odds in your favor should there be an early killing frost. If for some reason you have to plant part of your acreage late, use a shorter maturing hybrid, which really then becomes a full season hybrid.

In the case of silage production, higher tonnages can be obtained with hybrids that have a maturity of 5 greater than the full season hybrid recommended for corn grain (see map) in your area. You will be risking silage quality by using them, however, because the later maturing hybrids might not reach physiologic maturity before the first frost. Ensiling at whole plant moisture content of greater than 70 percent will result in lower quality silage. When corn is at physiologic maturity, the whole plant moisture usually is below 70 percent. If frost occurs before maturity, wait until whole-plant moisture content is 70 percent before harvesting. When kernel moisture is about 30 percent, whole plant moisture content is near 70 percent.

Type of Hybrid. Corn hybrids may be single crosses, double crosses, or three-way crosses (see glossary for definitions). On the average, highest yields of grain and high quality silage result from planting single crosses. Research results indicate that the yield of three-way crosses is intermediate between single and double

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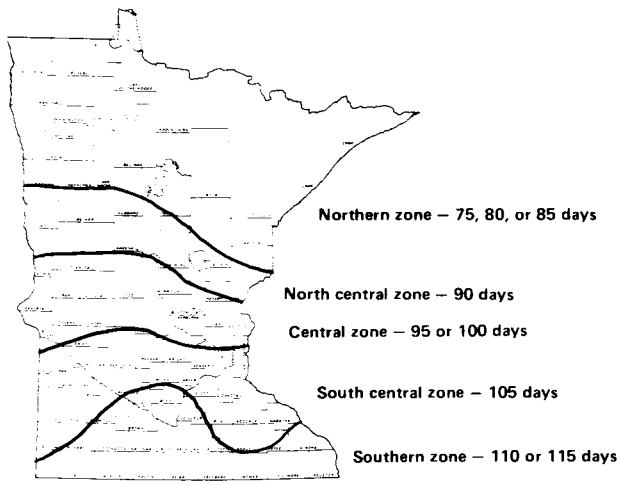

Corn grain growing zones and day classifications

crosses. Seed costs usually are higher for single crosses.

Some hybrids are called "silage hybrids" or "silage blends" and may be priced lower than other hybrids. *Remember: High grain yields are necessary to produce maximum yields of high energy silage.* If the silage hybrids or blends do not produce high grain yields, they cannot produce high quality silage. The University of Minnesota recommends that high grain yielding hybrids be used to ensure the highest tonnage of high energy silage. In general, seed prices of high grain yielding hybrids are more expensive, but purchasing such hybrids probably is well worth the extra money.

Yield. *Grain and silage yielding ability is the most important characteristic of a corn hybrid.* Select what you believe to be the highest yielding hybrids for your area by talking to corn seed salesmen, corn company agronomists, your county agricultural agent, vocational agriculture teachers, and other farmers who grow corn. Performance on your farm under your management conditions is the final test. Keep good yield records each year and plant those hybrids that perform best for you.

Optimum yields with the best hybrids can be obtained only with a good fertility program. *Be sure to have your soil tested so you know what fertilizers are needed for best yields.*

Plant Population to Use

The optimum plant population to produce maximum grain and silage yields will vary with the hybrid and the soil category (see unit 1 of this course). Harvest stands of 22,000 to 24,000 plants per acre usually produce maximum grain and silage yields for the full season hybrids grown on medium and fine textured soils. These soils generally have good water-holding capacity in north central and northeastern Minnesota and can support these plant populations. If you are using an earlier maturing hybrid for your growing zone, plant populations can be raised by about an additional 4,000 plants per acre.

If you have coarse textured soils, lower the plant population by 4,000 plants per acre (18,000 to 20,000). This is necessary because of the lower water-holding capacity (dryness) of such soils.

Some growers increase plant populations by 2,000 to 4,000 plants per acre when they are growing corn for silage. Remember that the highest quality silage results from maximum grain yield; be sure the hybrid you are using will produce high grain yields at the higher populations. *You may get more tonnage with the higher population, but the quality of the silage will be reduced if grain yields are lower.*

Planting Date

University research has shown that planting date is one of the most important management decisions you make. If corn is not planted at the proper time, other management decisions such as amount of fertilizer to use, methods of fertilizer applications, maturity of hybrid, and insect and weed control practices are all affected. In determining the best planting date for your farm, the two most important considerations are yield of corn grain or silage and the possibility of frost damage in both spring and fall.

Yield. *Early planting produces the highest yields of both grain and silage.* Yields begin to decline when planting takes place later than the first week in May. In north central Minnesota, corn generally can be planted starting the last week in April on coarse textured soils and by the 1st of May on medium and fine textured soils. In northeastern Minnesota, the planting date will be somewhat later, especially farther east, because of the influence of Lake Superior. A good general rule of thumb is that as soon as a good seedbed can be prepared in the spring, corn should be planted.

If you get your corn planted on time, germination and emergence may be a little slow because of the lower soil temperatures. Shallow planting, about 1 inch deep, places the seed in the warmest soil and will result in faster germination and more even emergence.

In northeastern and north central Minnesota, it is very important to use an NPK starter if you plant on time. On coarse textured soils that are normally deficient in sulfur, it also is important to include about 10 pounds of sulfur in the sulfate form with this starter.

Frost Damage. Early planting may cause some concern about plant damage from late occurring spring frosts. Remember, however, that the growing point remains below the ground for 2 to 3 weeks after plants emerge, which protects them from serious damage unless there is a prolonged period of very low temperatures. The damage to young corn seedlings may appear to be serious because of leaf loss due to frost, but normally the plants grow out of it and no yield loss is realized.

There is a much greater potential for corn yield loss if corn is planted too late and an early fall frost kills the plants before physiologic maturity. Grain and silage yield losses due to early fall frost can be avoided if corn is planted early.

Fertilizing Corn

Knowing what fertilizers to use and when to apply them is extremely important in any successful corn growing program. *The most important thing you can do for your fertility program is to have your soil tested so you know what is needed.* It also is important that you have optimistic but realistic yield goals so that the best fertilizer recommendations can be made. Soil testing and fertilizer recommendations have been covered in units 1 and 3 of this course, but the following points bear repeating:

- *Starter fertilizer.* If you plant early, use an NPK starter on all soils (include sulfate-sulfur on coarse textured soils).
- *Nitrogen fertilizer.* On medium and fine textured soils, nitrogen can be applied as either preplant or sidedress. The amount you apply depends primarily on your previous crop and yield goal.

  On coarse textured soils, most of the nitrogen should be applied as a sidedress to avoid leaching losses. Again the amount of nitrogen to apply depends on previous crop and yield goal. University research shows that including a nitrification inhibitor is beneficial. Include it with your sidedress application of nitrogen.
- *Phosphorus and potassium fertilizers.* You must soil test to see whether your soils need these nutrients and how much they need. Since silage removes the whole plant, additional phosphorus and potassium usually are needed when corn is grown for silage.
- *Other fertilizers needed for growing corn.* Nitrogen, phosphorus, and potassium are the three most needed plant nutrients. Coarse textured soils often need sulfur as well as magnesium. A soil test will tell you what your soils need. Zinc may be needed on medium and fine textured soils with a limy subsoil, but don't apply it unless the soil test calls for it.

Pest Control for Corn

Several kinds of insects and diseases can affect corn yields. Many corn hybrids, however, have resistance to some diseases and insects, so chemical control is not often recommended. Exceptions to this are insecticides that are generally recommended for corn rootworm larvae control if corn is grown following corn. Cutworm control may be necessary when stands are reduced due to cutworm feeding. See your county agricultural agent to find out what the major insect and disease problems are in your area and for advice on how to control them.

The major pest in corn is weeds. Controlling weeds is essential to producing high yields of corn grain and silage. Applying herbicides specifically for the weeds in your fields before or at planting, followed by rotary hoeing, cultivation, or postemergence application of herbicides, should be effective in controlling both early and late germinating weeds. Weed identification is extremely important so you can apply the right herbicide. Again, see your county agricultural agent for information on weed identification and the latest information on weed control.

Harvesting and Storing Corn

Grain can be harvested anytime after it has reached physiologic maturity—when the kernel moisture content is about 32 percent or lower. Remember that physiologic maturity is reached when the black layer has formed in the grain (see unit 5 for information on how to identify black layer formation).

If your corn is field shelled, the grain must be dried and closely managed while in storage to maintain high quality grain. If you ear harvest your corn and store it in narrow cribs, the grain will dry while in storage without spoilage.

Highest quality silage is obtained when the corn is harvested at a whole plant moisture content of 65 to 70 percent. Again, this moisture content is reached when the grain has reached physiologic maturity. Another way to determine whether corn has reached maturity and is ready to harvest for silage is to remove some kernels from the center of the cob and squeeze them to see whether there is any milky material in them. If there is no milky material the corn has reached maturity and should be harvested for high quality silage.

Glossary of Terms

Full season hybrid: A hybrid that utilizes the whole growing season; that is, a hybrid that is planted prior to May 15 and reaches maturity just prior to the first average date for killing frost.

Hybrid: The first generation resulting from the cross of two unrelated parents.

- —Single cross: a hybrid resulting from the cross of two unrelated parents.
- —Double cross: a hybrid resulting from the cross of two single crosses.
- —Three-way cross: a hybrid resulting from a cross when one parent is an inbred line and the other parent is a single cross.

Nitrification inhibitor: A chemical added to a nitrogen fertilizer that keeps the nitrogen in a nonleachable and nondenitrifiable form for 6 to 8 weeks after application of the nitrogen. The two common products on the market are N-Serve and Dwell.

Physiologic maturity: Stage of development in corn at which maximum dry weight is accumulated. Growth stops at this stage. Sometimes referred to as just maturity.

Preplant fertilizer: Fertilizer applied before the crop is planted. Preplant fertilizer most often refers to nitrogen but can include other plant nutrients.

Relative maturity: A system of ranking hybrids from short to full season by comparing kernel moisture content at normal harvest dates to the kernel moisture content of selected "standard" hybrids.

Silage blends: A seed mixture of two or more corn hybrids that the seller designates or claims to be a "silage blend." Such blends are not recommended by the University of Minnesota because the buyer does not know whether they are the high yielding hybrids necessary for high energy silage.

Growing Corn for Grain and Silage

Please fill out and return

Name_____

Address_____ County_____

1. What corn maturity zone do you live in?

   What calendar date do you set for planting corn?

   Have you planted corn prior to May 5? Have you had late spring frost damage to early planted corn?

2. What factors on your farm determine your optimum plant population?

3. How do you select corn hybrids for silage production?

4. What hybrid relative maturity is full season for your farm? Do you use more than one relative maturity hybrid?

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5. What are your most common weeds? What have you found to be the best methods to control these weeds?

6. What insects have you seen in your corn fields?

7. Please list any questions you have about producing high quality corn grain and silage.

The following material also is available on request. Please check those you would like to receive.

- ☐ *Controlling Corn Rootworms,* Entomology Fact Sheet 14
- ☐ *Controlling Cutworms,* Entomology Fact Sheet 48
- ☐ *Controlling Indianmeal Moth in Stored Shelled Corn,* Entomology Fact Sheet 8
- ☐ *Date of Planting Corn,* Agronomy Fact Sheet 23
- ☐ *European Corn Borer Control in Field Corn,* Entomology Fact Sheet 40
- ☐ *Fertilizing Corn,* Soils Fact Sheet 24
- ☐ *Herbicide Symptoms in Corn,* North Central Regional Publication 94
- ☐ *Minnesota Relative Maturity Rating of Corn Hybrids,* Agronomy Fact Sheet 27
- ☐ *Natural-Air Corn Drying,* M Sheet 164
- ☐ *Selecting a Corn Hybrid,* Agronomy Fact Sheet 22
- ☐ *Weed Control in Corn,* Extension Folder 641

Silage hybrids: Corn hybrids that are designated by the seller as "silage hybrids." These may vary from seller to seller. Such hybrids are not recommended by the University of Minnesota because the buyer does not know whether they are the high yielding hybrids necessary for high energy silage.

Starter fertilizer: A fertilizer applied either with the seed or in a row near the seed at planting time. Only small amounts of fertilizer can be applied if the starter is placed with the seed. Applications should not exceed 20 pounds per acre of N plus K_2O if the fertilizer is placed directly with the seed. If a 2x2 starter is used, any amount of starter can be used without germination damage. An NPK starter fertilizer contains nitrogen, phosphorus, and potassium.

Water-holding capacity: A term used to describe the amount of water that a soil can retain. Sandy soils have a lower water-holding capacity than do fine textured soils. Low water-holding capacity soils are droughty or dry soils.

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